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Identifying Critical Issues and Problems In Technology Education Using A Modified-Delphi Technique

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The need to plan for the future is critical to the overall health of any organization. However, planning is often biased by the opinions of a select group of individuals who may not possess the knowledge and/or empirical data to formulate a plan that could address the most critical current and future concerns and issues facing the agency/institution. Most educational planning is designed for the short term (i.e., semesters, academic year) and involves establishing specific policies and procedures, often having little to do with vital targets that could be made operational for the medium and long range futures of the institution/agency. Strategic planning on the other hand, is designed to aid decision makers in making important changes based on strategically driven decisions (Goodstein, Nolan, & Pfeiffer, 1992). That is, in order to make strategic decisions, a strategic plan must be in place. Therefore, strategic planning is "the process by which the guiding members of an organization envision its future and develop the necessary procedures and operations to achieve that future" (Goodstein, et.al., 1992, p. 3).

Gup (1979) perceived strategic planning to be based around three distinct yet basic questions, (1) Where are we going?; (2) What is the environment?; and (3) How do we get there? The first question revolves around the stated mission of the organization. Establishing the overall purpose of the educational agency or institution sets the direction for all activities. The driving concept and philosophy should be specified so there is a clear understanding of what "business" the organization is seeking to accomplish. In answering the second question, the decision makers must determine those factors which impact on the organization. What are the opportunities, hazards, and issues that influence the success or failure of the organization? If decision makers are to make reasonable efforts in projecting their organization forward, they must accurately identify the mechanisms that will aid them in accomplishing their objectives and/or the obstacles that may prevent them from accomplishing their objec-

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tives. The third question, "How do we get there?" seeks to identify the approaches that could be used to successfully accomplish the mission of the organization.

Considerable effort has been made by the International Technology Education Association (ITEA) in establishing a professional improvement plan (International Technology Education Association, 1990). This strategic plan lists the six major goals of the association, followed by a number of objectives and strategies designed to establish a mechanism to aid in the accomplishment of the primary goals. Even with the professional improvement plan in place, the question must be asked, "Is this the environment of technology education?" Were the identified goals of the strategic plan established by an exhaustive evaluation of the critical issues and problems that are facing the profession currently? How assured are we that the goals and objectives identified on the professional improvement plan can solve the problems and issues facing the profession in the future? Waetjen (1991) building a case for research within technology education, states:

> Die-hards claim that research isn't needed and instead offer up dozens of anecdotal accounts of students who have benefitted from taking courses in technology education. But no matter how titillating the anecdotes, they simply do not convince deans, superintendents and boards of education. Only research results will be convincing. Research has moved from the periphery to the very core of the educational process. Indeed, research has established itself as a primary vehicle by which change is promoted and effected in education. Research now has a major impact on the focus, direction, and development of all aspects of education - and properly so. Can technology educators ignore this powerful force that increasingly will shape educational decisions? (p. 3).

"Technology Education: Issues and Trends" was the theme of the 1985 Technology Education Symposium VII. Donald Maley, keynote speaker at the symposium, addressed a series of perceived issues and trends for the technology education profession. Lin (1989) conducted research to investigate the nature of the current technology education movement and its impacts, problems, directions, as well as prospects for the future development of technology education. Other authors have identified current issues, trends, and problems impacting on the field (i.e., Lauda, 1987; Smalley, 1988; Wenig, 1989). In 1984 the American Industrial Arts Association - Board of Directors identified "Ten opportunities which will advance the profession the most". The efforts of these individuals presented perceptions of problems and issues for technology education. They were identified through individual and/or group experiences that have relevance and may be accurate, they should not be dismissed. However, no research-based evaluation has been conducted that systematically identifies the critical issues and problems for technology education. Therefore, if the class-

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room teachers, teacher educators and the supervisors/administrators of technology education hope to direct the profession into a desirable future they must understand the issues and problems that will influence the success or failure of technology education. Anyone can have opinions about the field of technology education. However, such opinions are subject to individual bias and may not support empirical data. The need to gather empirical data to accurately identify the critical issues and problems facing technology education is crucial to the future of this profession.

Purpose of This Research

The purpose of this research was to determine the present and future critical issues and problems facing the technology education profession. A critical issue was defined as: Of crucial importance relating to at least two points of view that are debatable or in dispute within technology education. A critical problem was defined as: A crucial impediment to the progress or survivability of technology education. The term "present" was defined as: The current conditions under which the technology education profession is operating. The term "future" was defined as: A projected period of time of 3-5 years in the future. This span of time was judged as appropriate based on current strategic planning procedures used by the ITEA (5 year increments).

Based upon identified critical issues and problems the leadership of the technology education profession could more accurately design a path to achieve the primary mission of advancing technological literacy.

The following research questions were developed for investigation:

1. What are the critical issues that are currently impacting on the technology education discipline?
2. What are the critical problems that are currently impacting on the technology education discipline?
3. What are the critical issues that most probably will impact on the technology education disciple in the future (3-5 years)?
4. What are the critical problems that most probably will impact on the technology education discipline in the future (3-5 years)?

Methodology

Identifiable issues and problems were collected from a group of technology education professionals using the Modified-Delphi Technique designed by Dalkey and Helmer (1963) and revised by Delbecq, Van deVen, and Gustafson (1975). The primary objective of a Delphi inquiry is to obtain a consensus of opinion from a group of respondents (Salancik, Wenger and Helfer, 1971; Rojewski and Meers, 1991). Delbecq, et al. further state: "Delphi is a group process which utilizes written responses as opposed to bringing individuals together" (p. 83). Additionally, Rojewski and Meers (1991:11) stated that:

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> Typically, the Delphi technique is used to achieve group consensus among participants. Consensus is determined using the interquartile range of each research priority statement. Interquartile range refers to the middle 50% of responses for each statement (i.e., distance between first and third quartiles).

This study used a four round Delphi process to ascertain and prioritize the critical issues and problems in technology education. Descriptive and ordinal level data collection and analysis was used to interpret group suggestions and opinions into a collection of descriptive information for decision making.

Population

The group selected for this study was composed of 25 panelists from 15 states and the District of Columbia. They represented technology education through three distinct groupings: seven secondary classroom teachers, nine teacher educators, and nine secondary and collegiate supervisors/ administrators. Because the success of the Delphi Technique relies upon the use of informed opinion, random selection was not considered when selecting the Delphi participants. However, demographics and gender were taken into consideration when selecting the Delphi team. Each region of the ITEA was represented and four women were members on the team. The participants that were selected are considered to be the well informed leading authorities in their field by their colleagues, supervisors, and peers. Criteria used in selecting the participants was based on their history of involvement in national and state professional associations representing technology education as well as their ability to formulate their thinking through writings and research.

University teacher educators of technology education and supervisors/administrators of technology education selected for the Delphi team averaged 23 years of experience in the field of industrial arts/technology education with an average of 32 publications relating to the field of industrial arts/technology education. Selection of the classroom teachers for the Delphi team was accomplished by an identification process which used two national surveys (one to state supervisors/administrators and one to university department heads of technology education) requesting the identification of the top three classroom teachers of technology education within their state. The following preliminary qualifying criteria was presented on the survey: (1) Currently teaching in a high quality secondary level technology education program; (2) Minimum of three years teaching experience as a secondary level classroom technology education teacher; (3) Prior experience in developing curriculum materials for technology education at the secondary level; (4) Creative and innovative thinkers in technology education; (5) Technically competent in their assigned teaching area; (6) Actively participates in state and national professional associations relating to technology education. The results of these sur-

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veys yielded 204 possible candidates for this Delphi study from which seven were selected.

Procedure

The first Delphi probe asked the panel to identify exhaustively the critical issues and problems for technology education using the four guiding questions created for the panelists. The issues and problems were divided into four parts: present issues, future issues, present problems, and future problems. The panel was provided a cover letter describing the process they were to follow plus definitions for the terms: critical issues, critical problems, present, and future. The second probe of the Delphi was designed to prioritize the identified issues and problems and begin the process of consensus. The third and fourth probe sought to improve the levels of consensus on the highest priority issues and problems. Descriptive statistics were used to analyze the data; critical issue and problem priorities were rank ordered; means, medians, and standard deviations were calculated for each item identified on the Delphi probes. Consensus on the prioritized critical issues and problems were determined by computing the interquartile range for each of the identified items. Each probe of the Delphi was completed by all of the participants thus yielding a 100% return rate.

Analysis of Findings

Delphi I

The first Delphi probe served as a beginning point for the study. Panel members identified a total of 580 items [143 Present Issues, 105 Future Issues, 198 Present Problems, 134 Future Problems] representing critical issues and problems for technology education. Based on the total number of identified issues and problems submitted key descriptors were identified from each entry and then grouped according to like classifications under each section of the study (Present Issues, Future Issues, Present Problems, and Future Problems). This procedure required the use of a review panel composed of two university professors and one graduate student from the technology education program area at the authors' university. Upon completion of the classification process there were 17 items in the Present Issues section, 21 items in the Future Issues section, 43 items in the Present Problems section, and 24 items in the Future Problems section. These classified items formed the basis for the critical problems and issues were evaluated further during the second and subsequent Delphi probes.

Delphi II

The purpose of the second Delphi probe was to determine the relative rank or priority of the items identified under each of the sections. Panel members were asked to select the top 15 critical issues or problems from the collapsed

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category list within each section. They were then asked to prioritize those top 15 issues or problems. Analysis of the responses involved a summation of each of the items along with consensus analysis within the specific sections. This initial classification of the top 15 critical issues and problems along with the analysis of consensus within the group (Interquartile Range [IQR]) are identified in Table 1. The high IQR scores indicate a wide variance of opinion in positioning the ranked items, this was not unusual for the first attempt of classifying a large list such as this.

Delphi III

The purpose of the third probe of the Delphi was to gain greater consensus of the top 15 critical issues and problems facing the technology education discipline. Based on the responses from probe 2, the panel members were asked to refer to their previous analysis and compare them with the identified top 15 issues and problems of the overall group. They were then asked to rank order the issues and problems again. Changes in the priority ranking from probe 2 to probe 3 can be observed in Table 2. The degree of consensus within the Delphi panel group improved, see IQR on Table 1 and IQR on probe 3 of Table 2. However, there were major changes in the prioritization of the critical issues and problems within each of the sections (Present Issues, Future Issues, Present Problems, Future Problems).

Delphi IV

The consensus process was refined further during the fourth probe of the Delphi. Panel members were asked again to examine their previous responses with regards to the overall group responses of the critical issues and problems and to make a final judgment as to their priority of importance relevant to technology education. Based on these evaluations, greater consensus was achieved within the group as evidenced by lower interquartile range scores (see comparison of probe 3 vs. probe 4 IQR scores in Table 2). The rank order of the critical issues and problems was maintained in most instances throughout the four sections of the Delphi probe (see table 2).

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Table 1
Results of Delphi Probe 2

Present Issues

Rank	Priority Statement	Mean	SD	IQR	Mdn
1.	Curriculum development approaches for Tech. Ed.	3.4	2.85	3.00	3.0
2.	Interdisciplinary approaches to teaching Tech. Ed.	5.2	3.22	3.50	5.0
3.	Identity of the knowledge base of Tech. Ed.	5.2	4.78	5.00	4.0
4.	Recruitment of students and teachers in Tech. Ed.	5.3	3.49	5.50	4.0
5.	Adequate funding sources for Tech. Ed.	5.9	3.16	5.00	7.0
6.	Difficulty of changing from Industrial Arts to Tech. Ed.	6.2	4.58	6.50	5.0
7.	Revisions and developments in teacher Education for Tech. Ed.	7.3	3.43	6.00	7.0
8.	Methodology strategies for teaching Tech. Ed.	9.5	3.69	6.00	9.0
9.	Certification options and strategies for Tech. Ed.	9.5	3.78	6.50	10.0
10.	Tech. Ed.'s affiliation with Voc. Ed.	10.4	4.23	8.50	11.0
11.	Clear research agenda for Tech. Ed.	10.6	3.65	6.00	11.0
12.	Leadership (or lack of) within the Tech. Ed. profession	10.8	4.24	7.00	11.0
13.	Technological literacy concerns for Tech. Ed.	10.8	4.38	7.00	12.0
14.	Professional association impact on the Tech. Ed. discipline	12.3	2.78	3.50	13.0
15.	Program closings and eliminations in Tech. Ed.	12.4	4.26	6.00	14.0
16.	Number of females in Tech. Ed.	12.7	3.60	5.00	14.0

Future Issues

Rank	Priority Statement	Mean	SD	IQR	Mdn
1.	Curriculum development paradigms for Tech. Ed.	5.1	4.71	8.50	3.0
2.	Knowledge base identification for Tech. Ed.	6.1	4.98	9.00	5.0
3.	Business, industry and political support for Tech. Ed.	6.2	4.75	7.00	6.0
4.	Interdisciplinary approaches for Tech. Ed.	6.4	4.53	7.50	5.0
5.	Positioning of Tech. Ed. in the school program	7.0	4.95	8.50	5.0
6.	Funding of Tech. Ed.	8.4	4.38	7.00	9.0
7.	Defining measurable outcomes for Tech. Ed. students	8.6	4.68	8.50	10.0
8.	Alternative vs traditional certification designs for TE	9.6	5.24	11.0	10.0
9.	Leadership directions and training for Tech. Ed.	10.4	4.37	8.50	10.0
10.	Conversion validity from Industrial Arts to Tech. Ed.	10.8	5.15	9.50	12.0
11.	Elementary option/emphasis in Tech. Ed.	11.2	4.35	7.50	12.0
12.	Voc. Ed. influences & relationship with Tech. Ed.	11.4	4.64	7.50	12.0
13.	Technological literacy and the role of Tech. Ed.	11.6	4.50	7.00	13.0
14.	Research agenda for Tech. Ed.	11.7	3.71	7.50	12.0
15.	Methodologies for teaching Tech. Ed.	11.7	3.84	6.50	12.0

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Table 1 (cont.)
Results of Delphi Probe 2

Present Problems

Rank	Priority Statement	Mean	SD	IQR	Mdn
1.	Inadequate marketing and public relations of Tech. Ed.	3.8	3.92	4.75	2.0
2.	Inadequate financial support for Tech. Ed.	7.8	5.21	10.5	6.0
3.	Lack of consensus of curriculum content for Tech. Ed.	9.0	5.21	9.50	10.0
4.	Shortage of Tech. Ed. teachers	9.0	5.44	11.25	8.0
5.	Teachers resistance to changes within Tech. Ed.	9.8	5.28	11.75	11.0
6.	Inadequate methodological training/inservicing for Tech. Ed.	9.9	6.02	12.0	11.0
7.	Inadequate/inappropriate Tech. Ed. teacher preparation	10.2	6.22	13.75	12.5
8.	Declining enrollments in Tech. Ed. courses	11.1	5.88	11.75	16.0
9.	Inadequate/ineffective leadership within Tech. Ed.	11.2	5.41	10.5	13.0
10.	Deficient knowledge base for Tech. Ed.	11.3	5.41	10.75	16.0
11.	High schl graduation requirements restrictions on TE	11.5	5.89	11.0	15.5
12.	Insufficient research base for Tech. Ed.	11.7	4.75	8.50	14.0
13.	Inaccurate understanding & support of Tech. Ed. by administrators & counselors	12.0	4.35	7.75	12.5
14.	Slow transition and retraining of teachers to Tech. Ed.	12.0	4.35	7.75	12.5
15.	Insufficient business, industry and parental support for Tech. Ed.	12.0	4.68	9.75	15.5
16.	Title change without content change in Tech. Ed.	12.9	4.47	5.00	16.0

Future Problems

Rank	Priority Statement	Mean	SD	IQR	Mdn
1.	Insufficient quantities of Tech. Ed. teachers and elimination of teacher education programs in Tech. Ed..	3.4	3.73	3.50	1.0
2.	Loss of Tech. Ed. identity, absorbed within other discipline	5.9	5.34	6.00	4.0
3.	Poor and/or inadequate public relations for Tech. Ed.	7.6	4.08	6.00	8.0
4.	Insufficient funding of Tech. Ed. programs	8.0	5.34	6.00	4.0
5.	Non-unified curriculum for Tech. Ed.	8.3	4.94	9.00	8.0
6.	Inadequate involvement of Tech. Ed. personnel in educational reform issues	8.6	4.14	6.50	8.0
7.	General populous ignorant regarding technology and the discipline of Tech. Ed.	8.8	4.62	7.00	9.0
8.	Elimination of Tech. Ed. programs	9.3	5.99	13.0	8.0
9.	Inadequate business & industry support of Tech. Ed.	9.3	4.62	7.50	9.0
10.	Inadequate leadership/leadership training for Tech. Ed.	10.0	5.03	10.5	10.0
11.	Inadequate research base for Tech. Ed.	10.1	4.93	10.0	11.0
12.	HS graduation requirements reduce opportunities for Tech.Ed. courses	10.2	4.34	9.00	9.0
13.	Inferior in-service training for Tech. Ed.	10.7	4.62	9.00	12.0
14.	Inappropriate certification procedures for Tech. Ed.	11.6	4.41	7.50	13.0
15.	Inadequate knowledge base for Tech. Ed.	12.0	4.98	7.00	15.0

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Discussion

Research Questions

The purpose of this research was to determine the present and future critical issues and problems facing the technology education field. Each of the four research questions were addressed and resulted in the identificaion of the top 15 critical issues and problems confronting the technology education discipline (see Table 3). The Delphi team members that identified these criteria of critical issues and problems were in overall agreement as to their character and rank order of importance. The interquartile range found extremely low variability for all issues and problems that were addressed in this research. Only 12 issues and problems indicated even a slight difference in consensus (IQR = 0.75-1.75) with seven of these with an IQR of less than one. Based upon these identified critical issues and problems one may now more accurately design a path to respond to these serious concerns and problems in technology education.

Trend Extrapolation

With the identification of the critical problems and issues in technology education several trends surfaced. In an examination of the top five (5) criteria within the issues and problems sections of this research, three (3) issues-/problems were identified multiple times. The most prominent criterion (identified within the top five critical issues and problems in all four sections) was the aspect of curriculum development concerns. Curriculum development approaches, curriculum development paradigms, lack of consensus of curriculum content, and non-unified curriculum were identified in each of the research sections respectively. This indication of curriculum concerns within the top five issues and problems sections was evidence of the strong need to design technology education curriculum that addresses a comprehensive approach to curriculum development. Although recent publications have identified a curriculum framework for technology education (Savage and Sterry, 1991) that have provided an overall orientation for the curriculum, there was an identified need to develop this effort further and to establish a unified curriculum that would serve as a standard.

The second criterion that was identified multiple times within the top five (5) critical issues and problems for technology education was the aspect of knowledge base concerns. The identity of the knowledge base for technology education was indicated in both the present and future issues sections ranking number 1 and 3 respectively (see Table 3). The need to establish a formal knowledge base was viewed as foundational to the future of technology education. A formal knowledge base would help in establishing needed precedents for future development within the field. The final criteria that was identified more than once in the top five (5) critical issues and problems sections was the concept of interdisciplinary approaches to the delivery of the technology educa-

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tion content. Interdisciplinary approaches to teaching technology education was selected as number 3 and 4 within the present issues and future issues section of this research. The need to integrate technology education with other disciplines was viewed as an essential element to the success of the field. The overlap of the descriptive issues and problem statements should be viewed as significant to developmental efforts in technology education however, caution should be exercised in placing priority to these particular issues and problems.

The 1990-95 Professional Improvement Plan published by the ITEA (1990) stated that the primary mission of the association was to advance technological literacy. The association presented six major goals designed to aid in the achievement of the overall mission. They are:

1. Provide a philosophical foundation for the study of technology that emphasizes technological literacy.
2. Provide teaching and learning systems for developing technological literacy.
3. Foster research to advance technological literacy.
4. Serve as the catalyst in establishing technology education as the primary discipline for the advancement of technological literacy.
5. Increase the number and quality of people teaching technology.
6. Create a consortium to advance technological literacy.

Of the six goals, numbers one through five were addressed specifically in the results from this research. This correlation was an indication that the efforts of the ITEA Professional Improvement Plan in working toward an appropriate direction to address pressing concerns and difficulties of technology education are on target. In addition to the Professional Improvement Plan, many other areas of need were identified in this research and should be further evaluated for possible actions.

Implications and Recommendations

The issues and problems that were identified in this research can serve as a foundational basis for future developmental efforts as well as evaluation criteria. By addressing the issues and problems, the leadership of technology education can proactively establish specific task force action groups to meet these challenges, strategically marshalling their use of human and physical resources.

Based on these findings the following recommendations are put forward:

1. Curriculum development should be given priority in further study and developmental efforts. The development of technology education curriculum with a central theme. High standards needs to be established at a national level and implemented at the state and local school levels.

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Table 2
Results of Delphi Probe 3 and 4

Present Issues		**Probe 3**					**Probe 4**			
Priority Statement	Rank	Mean	SD	IQR	Mdn	Rank	Mean	SD	IQR	Mdn
Identity of the knowledge base of TE	1	3.4	2.34	3.75	2.5	1	1.5	1.25	0.00	1.0
Curriculum development approaches for TE	2	3.6	3.17	4.50	2.5	2	3.1	2.85	0.75	3.0
Interdisciplinary approaches to teaching TE	3	4.8	3.01	3.75	4.0	3	3.4	1.71	0.00	3.0
Revisions and developments in teacher education for TE	4	5.8	2.92	3.00	6.0	4	4.3	1.46	0.00	4.0
Difficulty of changing from Industrial Arts to TE	5	5.9	3.25	4.75	6.0	5	6.2	2.75	1.75	5.0
Recruitment of students and teachers in TE	6	6.1	3.50	7.00	4.5	6	6.4	2.32	0.00	6.0
Methodology strategies for teaching TE	7	7.4	3.57	5.00	8.0	7	7.2	1.51	0.00	7.0
Adequate funding sources for TE	8	7.5	3.62	4.75	6.5	8	8.0	1.66	0.00	8.0
Technological literacy concerns for TE	9	9.5	3.51	5.75	9.5	9	8.6	1.76	0.00	9.0
Clear research agenda for TE	10	10.2	4.08	6.75	11.0	10	9.6	2.03	0.00	10.0
Certification options and strategies for TE	11	10.5	3.14	3.75	10.0	11	11.0	0.93	0.00	11.0
Program closings and eliminations in TE	12	10.8	4.59	6.25	13.0	13	11.3	2.42	0.75	12.0
Leadership (or lack of) within the TE profession	13	11.2	3.33	5.50	11.5	12	11.1	3.89	1.00	13.0
Professional association impact on the TE discipline	14	12.2	3.35	5.00	13.0	14	12.9	3.10	0.00	14.0
TE's affiliation with Vocational Education	15	12.4	2.88	4.00	13.0	15	14.9	0.28	0.00	15.0

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Table 2 (cont.)
Results of Delphi Probe 3 and 4

Future Issues			**Probe 3**					**Probe 4**		
Priority Statement	Rank	Mean	SD	IQR	Mdn	Rank	Mean	SD	IQR	Mdn
Curriculum development paradigms for TE	1	4.2	3.92	7.00	2.0	1	1.8	2.21	0.00	1.0
Positioning of TE in the school program	2	4.4	2.90	4.50	4.0	2	2.4	1.10	0.00	2.0
Knowledge base identification for TE	3	5.04	3.72	4.75	4.0	3	3.8	2.75	0.00	3.0
Interdisciplinary approaches for TE	4	5.08	3.61	3.75	4.5	4	4.1	1.56	0.00	4.0
Business & industry and political support for TE	5	5.4	3.98	6.75	4.5	5	4.7	0.95	0.00	5.0
Redefining the teacher education structure for TE	6	7.7	3.73	4.00	6.5	6	6.1	1.90	0.00	6.0
Funding of TE	7	7.9	4.09	6.75	7.0	7	7.0	0.71	0.00	7.0
Defining measurable outcomes for TE students	8	8.0	3.88	6.75	8.0	8	8.0	1.02	0.00	8.0
Leadership directions and training for TE	9	9.0	4.04	5.00	10.0	9	9.0	2.72	0.75	9.0
Elementary option/emphasis in TE	10	9.2	4.37	7.50	9.5	10	9.5	2.48	0.00	10.0
Methodologies for teaching TE	11	10.4	3.48	5.50	10.5	11	11.0	1.01	0.00	11.0
Technological literacy and the role of TE	12	10.5	3.48	6.00	11.5	12	11.2	1.70	0.00	12.0
Research agenda for TE	13	10.7	3.65	5.75	10.5	13	12.8	0.67	0.00	13.0
Alternative vs. traditional certification designs for TE	14	11.9	3.69	3.75	13.0	14	13.6	1.27	0.00	14.0
Conversion validity from Industrial Arts to TE	15	12.1	3.39	6.00	13.5	15	14.3	1.99	0.00	15.0

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Table 2 (cont.)
Results of Delphi Probe 3 and 4

Present Problems		**Probe 3**					**Probe 4**			
Priority Statement	Rank	Mean	SD	IQR	Mdn	Rank	Mean	SD	IQR	Mdn
Inadequate marketing and public relations of TE	1	4.5	3.91	6.75	3.5	1	1.2	0.90	0.00	1.0
Lack of consensus of curriculum content for TE	2	5.0	3.97	6.25	4.5	2	3.1	2.55	1.00	2.0
Inaccurate understanding and support of TE by administrators and counselors	3	6.0	2.81	4.00	6.0	4	4.0	2.76	0.00	3.0
Teachers resistance to changes within TE	4	6.1	3.45	4.25	6.0	3	4.0	1.17	0.00	4.0
Inadequate financial support for TE	5	6.7	4.66	9.50	6.0	5	5.0	1.41	0.00	5.0
High School graduation requirements restrictions on TE	6	7.8	4.69	9.75	7.5	6	5.9	1.48	0.00	6.0
Slow transition and retraining of teachers to TE	7	8.3	3.49	4.50	8.5	7	7.6	1.27	0.75	7.0
Inadequate/inappropriate TE teacher preparation	8	8.41	3.95	7.50	8.5	9	8.5	1.14	0.75	8.0
Shortage of TE teachers	9	8.45	3.98	7.25	8.5	8	8.4	2.22	0.00	9.0
Inadequate methodological training /inservicing for TE	10	8.6	4.17	7.00	10.0	11	10.7	1.44	1.00	10.0
Declining enrollments in TE courses	11	9.4	4.05	5.75	9.5	10	10.3	2.46	0.00	11.0
Deficient knowledge base for TE	12	9.4	4.24	6.50	10.0	12	11.3	2.82	0.00	12.0
Insufficient research base for TE	13	9.6	4.21	7.25	11.0	13	11.9	2.66	1.00	13.0
Title change without content change in TE	14	10.3	3.82	6.00	10.5	14	13.3	2.03	0.00	14.0
Inadequate/ineffective leadership within TE	15	10.7	4.09	5.75	11.5	15	14.2	2.01	0.00	15.0

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Table 2 (cont.)
Results of Delphi Probe 3 and 4

Future Problems			**Probe 3**					**Probe 4**		
Priority Statement	Rank	Mean	SD	IQR	Mdn	Rank	Mean	SD	IQR	Mdn
Insufficient quantities of TE teachers and the elimination of teacher education programs in TE	1	4.2	3.33	6.00	4.0	1	1.7	1.94	0.00	1.0
Loss of TE identity, absorbed within other disciplines	2	4.7	4.27	5.50	3.0	2	2.2	1.10	0.00	2.0
Poor and/or inadequate public relations for TE	3	5.3	3.58	6.50	4.0	3	3.7	1.98	0.00	3.0
General populous ignorance regarding technology and the discipline of TE	4	5.7	3.81	5.50	5.0	5	5.9	1.34	0.00	4.0
Non-unified curriculum for TE	5	6.3	3.84	7.00	5.5	4	5.8	2.09	0.75	5.0
Inadequate involvement of TE personnel in education reform issues	6	6.5	3.74	6.75	6.0	6	6.1	1.82	0.00	6.0
Insufficient funding of TE programs	7	7.2	3.71	4.00	6.0	9	9.2	1.20	0.00	7.0
Elimination of TE programs	8	8.1	4.55	8.75	9.0	7	7.4	2.56	1.00	8.0
High school graduation requirements reduce opportunities for TE courses	9	8.6	3.64	5.75	9.0	8	9.1	2.01	0.75	9.0
Inadequate business & industry support of TE	10	9.0	3.86	6.75	9.0	10	9.8	0.63	0.00	10.0
Inadequate research base for TE	11	9.5	3.33	6.75	9.5	11	10.2	2.50	0.00	11.0
Inadequate knowledge base for TE	12	10.6	3.76	5.00	12.0	12	11.5	1.17	0.00	12.0
Inadequate leadership and leadership training for TE	13	10.8	3.36	4.75	11.0	13	12.7	1.65	0.00	13.0
Inferior in-service training for TE	14	11.3	3.13	4.75	12.0	14	13.7	0.69	0.00	14.0
Inappropriate certification procedures for TE	15	11.6	3.00	3.50	12.5	15	14.7	0.69	0.00	15.0

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Table 3
Final Results of Delphi on Critical Issues and Problems in TE

Present Issues

Rank	Priority Statement
1	Identity of the knowledge base of TE
2	Curriculum development approaches for TE
3	Interdisciplinary approaches to teaching TE
4	Revisions and developments in teacher education for TE
5	Difficulty of changing from Industrial Arts to TE
6	Recruitment of students and teachers in TE
7	Methodology strategies for teaching TE
8	Adequate funding sources for TE
9	Technological literacy concerns for TE
10	Clear research agenda for TE
11	Certification options and strategies for TE
12	Leadership (or lack of) within the TE profession
13	Program closings and eliminations in TE
14	Professional association impact on the TE discipline
15	TE's affiliation with Vocational Education

Future Issues

Rank	Priority Statement
1	Curriculum development paradigms for TE
2	Positioning of TE in the school program
3	Knowledge base identification for TE
4	Interdisciplinary approaches for TE
5	Business & industry and political support for TE
6	Redefining the teacher education structure for TE
7	Funding of TE
8	Defining measurable outcomes for TE students
9	Leadership directions and training for TE
10	Elementary option/emphasis in TE
11	Methodologies for teaching TE
12	Technological literacy and the role of TE
13	Research agenda for TE
14	Alternative vs. traditional certification designs for TE
15	Conversion validity from Industrial Arts to TE

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Present Problems

Final Results of Delphi on Critical Issues and Problems in TE

Rank	Priority Statement
1	Inadequate marketing and public relations of TE
2	Lack of consensus of curriculum content for TE
3	Teachers resistance to changes within TE
4	Inaccurate understanding and support of TE by administrators and counselors
5	Inadequate financial support for TE
6	High School graduation requirements restrictions on TE
7	Slow transition and retraining of teachers to TE
8	Shortage of TE teachers
9	Inadequate/inappropriate TE teacher preparation
10	Declining enrollments in TE courses
11	Inadequate methodological training/inservicing for TE
12	Deficient knowledge base for TE
13	Insufficient research base for TE
14	Title change without content change in TE
15	Inadequate/ineffective leadership within TE

Future Problems

Rank	Priority Statement
1	Insufficient quantities of TE teachers and the elimination of teacher education programs in TE
2	Loss of TE identity, absorbed within other disciplines
3	Poor and/or inadequate public relations for TE
4	Non-unified curriculum for TE
5	General populous ignorant regarding technology and discipline of TE
6	Inadequate involvement of TE personnel in education reform issues
7	Elimination of TE programs
8	HS graduation requirements reduce opportunities for TE courses
9	Insufficient funding of TE programs
10	Inadequate business & industry support of TE
11	Inadequate research base for TE
12	Inadequate knowledge base for TE
13	Inadequate leadership and leadership training for TE
14	Inferior in-service training for TE
15	Inappropriate certification procedures for TE

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2. Greater emphasis should be placed on the development of the knowledge base for the technology education field of study. The need to further identify the working theories and concepts of technology education must be addressed in order for the field to move forward as a legitimate academic discipline.
3. Serious efforts should be established and implemented to communicate the purpose and scope of technology education to decision makers and interested people groups. All levels of technology education teachers and administrators need to be made aware of this serious issue/problem of public relations, positioning, and support gathering.
4. The Executive Director and the Board of Directors of the International Technology Education Association should evaluate the identified critical issues and problems and establish task force groups that will address the specific issues and problems.
5. Further research needs to be conducted to determine the views and perceptions of the rank and file teachers of technology education on perceived critical issues and problems for technology education.
6. Research of this type needs to be conducted periodically (every two to three years) to keep the technology education profession aware of needs and changing dynamics.

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